

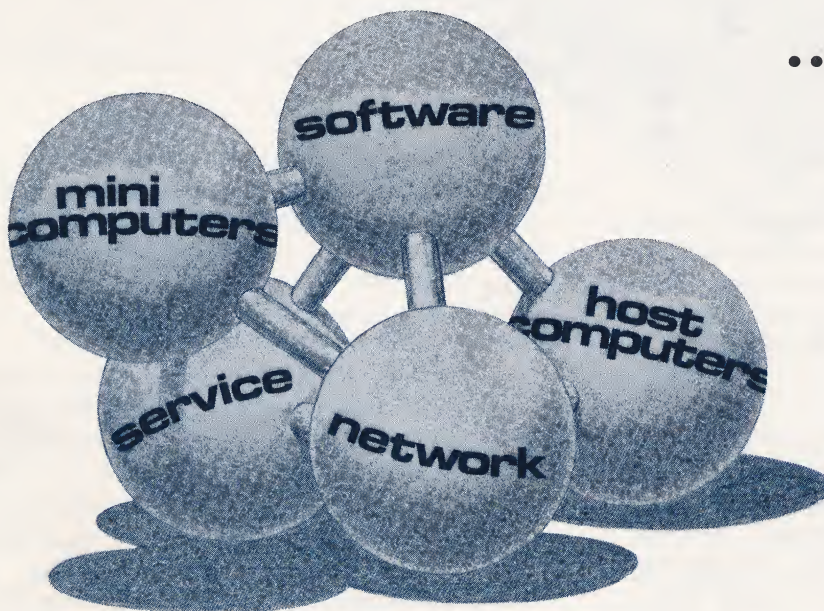
# *interactive computing*

The Newsletter of The Association of Time-Sharing Users  
and The Association of Small Computer Users

VOLUME 6, NUMBER 2

MARCH/APRIL 1979

## DISTRIBUTED PROCESSING



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of a new  
era?

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## **GE's New MarkLink System**

*Last December, General Electric Information Services announced a new dimension in time-sharing, calling it the MarkLink system. The system covers new ground in a fast-developing field which combines the best features of both distributed data processing and conventional time-sharing. While keeping ties to a centralized computer, the MarkLink system offers a small computer located at the customer site to pre-process the information.*

*GE's main selling point is the integration of services which the new MarkLink system offers. All the necessary hardware, software, maintenance, and networking facilities can be obtained from General Electric. There's no need to order minicomputer equipment from one supplier, get custom software from a systems house, call up the phone company to get data channels, and then make arrangements with a time-sharing service to get the system signed on. The entire job can be handled under one roof, including installation, networking, and customer support.*

*To market the MarkLink system (as well as conventional, Mark III time-sharing services), GE has changed its corporate structure. Formerly the General Electric Information Services Division, the firm has acquired Honeywell's time-sharing operations in the United Kingdom, Australia, and continental Europe. The combined enterprise is now called the GE Information Services Company.*

### **Elements of the MarkLink System**

MarkLink's computing resources include three elements: (1) on-site terminals and minicomputers, (2) data communications lines, and (3) host computers. This three-part package defines a computer system that includes both distributed processing and time-sharing.

Basically, the system works like this: users working at display terminals enter information which is sent to one or more on-site minicomputers. The minicomputers handle initial processing tasks, and when necessary, communicate (automatically) through GE network facilities to host computer centers. These house the permanent information base, master software library, data backup, and so on.

The minicomputers comprise the distributed processing element of the system. Through their use, communications to the host computer are minimized, thus cutting down on network communications use and on the cost of centralized processing. The logic of this approach is that it is cheaper to localize some processing tasks rather than send everything hundreds of miles away to the big CPU. While GE doesn't actually build the minicomputers and terminals, it does place its name on the products. Texas Instru-

ments makes the hardware under contract, with GE providing a modified operating system compatible with the overall approach. Up to 16 display units may be connected to a single minicomputer. The minis have their own floppy disks and, if needed, hard surface disk drives.

The host computers form the time-sharing portion of the system. They complete any complex processing tasks and keep the customer's numerous locations linked together in a common data environment. The raw power of a group of big mainframes tied together in a cluster provides an edge in processing and storing huge chunks of data, and in ensuring reliability of the system. These clusters are located in three cities: Cleveland, Ohio; Rockville, Maryland; and Amsterdam, The Netherlands. Through the network facilities, the computers can reach out to 600 metropolitan areas in 22 countries.

GE uses Honeywell 6088 computers at its end, but runs them under a special operating system. The approach used is called "transaction processing." Using this technique, if several remote users want to utilize the same software package, the computer places a single copy of the program in its active memory area, rather than generating a separate copy for each user. Through this "shared software"





method, GE says it has cut terminal response times nearly in half. We were told that response times of 4-6 seconds or less could be expected in most cases, in contrast with a lag of 8-10 seconds experienced with conventional time-sharing techniques. The same technique, we're told, is also applied at the mini-computer.

Tying the host and minicomputer subsystems together is a set of GE-owned and operated network lines. Here the emphasis is on the protocol used by the sending and receiving computers. While IBM 3780 protocol may be used (especially if an in-house mainframe is connected between mini and host), a newer development called X.25 protocol is preferred for the link to the GE host computers.

The X.25 protocol has become an international standard for information exchange, and it uses something called "packet switching" to allow several computer conversations on the same network line. (Please don't ask us for details on this one: we can

only tell you that, somehow, it lets several computers stay hooked up at once, giving each one the same 2400 baud communications performance.) Because the several conversations require only one line, the cost of transmission is lowered.

The unification of all the various aspects of this distributed processing package is perhaps the strongest aspect of the GE MarkLink system. GE provides the terminal hardware and maintenance, owns and services the communications lines, has worldwide facilities to service the multinational customer, and can write custom software as needed to support MarkLink user applications.

#### **Software Requirements**

The custom software aspect of GE's operation deserves some discussion. Although GE has some 5,000 regular time-sharing customers, with over 2,000 applications programs already on file, GE Distributed Systems Manager Arthur Simms told us



that most MarkLink customers would desire at least some custom software in order to take advantage of MarkLink's mix of local minicomputer and remote CPU. Some applications require a real-time (that is, continuous) connection to one of the central processing centers, while other applications would call up the center once an hour, once a day, or only as needed. The minicomputer's capability of editing, file storage, retrieval, and so on, could be utilized to minimize network or CPU charges, and of course the appropriate software is needed to break the task into minicomputer and host computer tasks. The software could, of course, be written by the customer, providing such resources were available.

According to Simms, while some custom software would likely be desirable, GE's staff of programmers would be able to get the software running "a matter of months" sooner than custom software houses could perform the same assignment. Such a claim might be buttressed by the sheer size of the GE operation. Some 2,000 employees of GE Information Services Company are located stateside; another 1,000 are stationed in Europe and Australia.

### **Cost Estimates**

The price of a MarkLink system depends, of course, on the number of terminals, printer, minicomputers and other devices involved. But aside from size, the customer has choices in each of three areas: terminal equipment, network access, and CPU access. GE provided us with the following sample price estimates:

Terminal equipment includes the display terminals, the minicomputers, line printers, floppy diskette or hard-surface disk drives, and local memory. This equipment may be either leased or purchased. A minimum system containing the minicomputer, two diskette drives, one CRT terminal, and the most inexpensive printer would cost \$800 a month including both rent and maintenance. The same configuration would sell for \$21,260.

A large terminal system with 16 CRT terminals, a minicomputer with two hard-surface disks (20 Mega-

bytes total), a good-sized local memory store (352 Kilobytes) and two high-speed printers would rent for \$3,690 per month or sell for \$93,290.

Data transmission facilities are provided by GE on either a leased-line or dial-up basis. These are special data lines, not voice lines, and are maintained separately from conventional Bell System lines, since they are owned by GE. The prices quoted were based on a distance of 50 miles or less to the nearest GE network node, or connection point, which we were told existed in most major cities. With the leased line, for a cost of \$830 a month, unlimited transmission would be allowed. The dial-up line option costs \$25 per hour while in use.

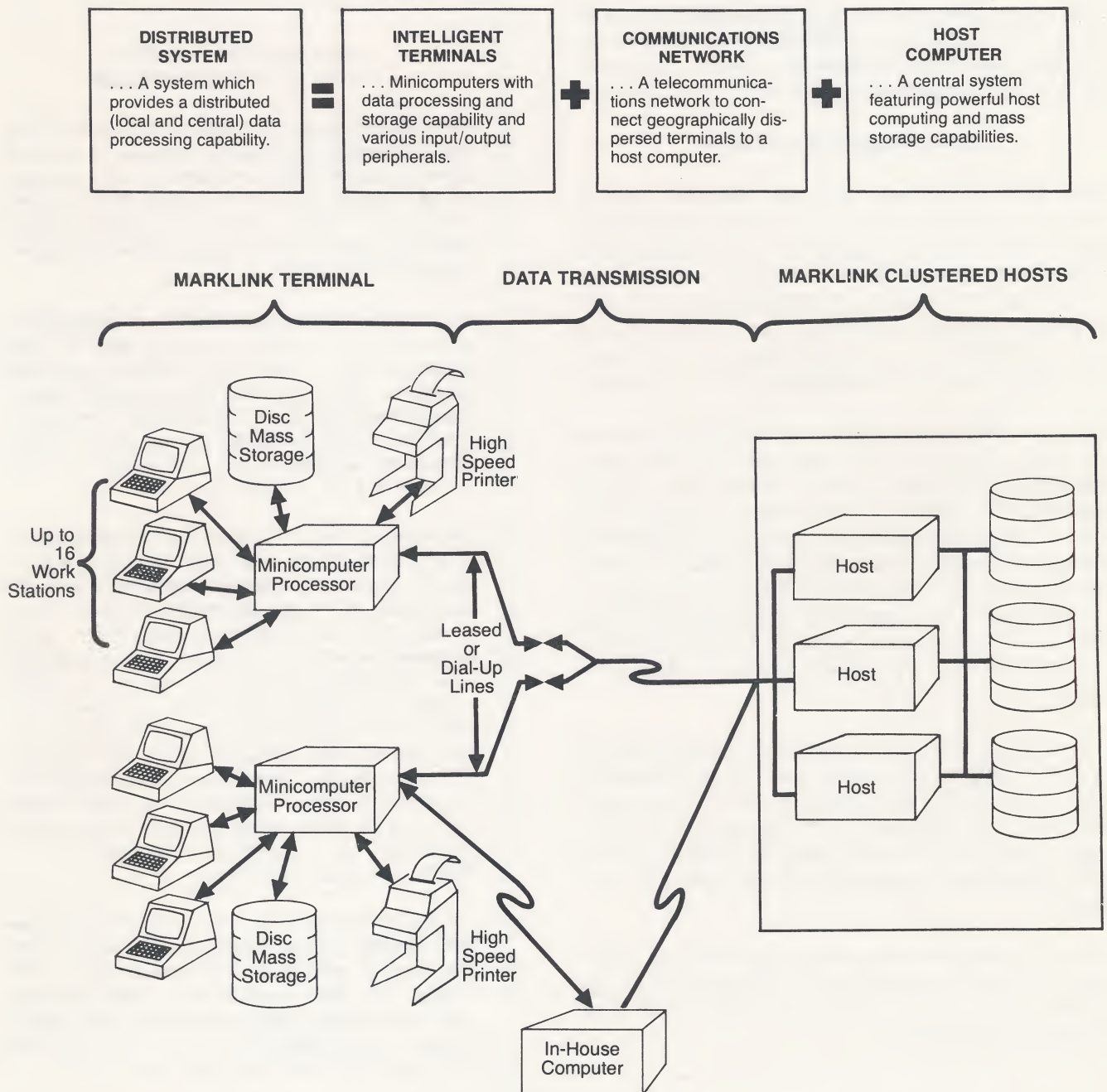
According to Mr. Simms, these network prices are very competitive. "I would be astounded if any other remote computing service offered data transmission prices anywhere near that price," he said.

CPU time likewise is available in either of two plans: (1) in small quantities, or (2) at a fixed price. The retail cost, used for standard customers (some get a break on this price for various reasons, said Simms) is 13 cents per Computer Resource Unit, or CRU. Storage is assessed at 11 to 80 cents per unit depending on the nature of the storage. "Of course," joked Simms, "Don't expect that any customer would get a monthly bill for 13 cents." We knew he wasn't kidding when he mentioned the minimum monthly price for a fixed allotment of processing: \$15,560. Under the fixed allotment plan, processing up to an agreed-on limit is handled with a monthly fixed charge.

Such fixed CPU charges, said Simms, appeal to large customers who wish to ensure that their data processing bills remain stable over a period of time. Two- to five-year agreements are possible fixing these charges and allowing the customer up to a certain amount of central processing. The minimum fixed amount just mentioned would be adequate for some order entry and inventory control applications of a multi-location company.

The first company installing the MarkLink system, we're told, is a national wholesaler with just these

## MARKLINK\* System Data Flow Diagram



\*Service Mark of the General Electric Company



order enter and inventory control applications in mind. They plan to install 900 display terminals linked to 170 on-site minicomputers which in turn will talk to the full-size computers at GE's computing centers.

### **Competition in the Market**

GE's Simms admitted that the MarkLink system would not initiate a "new era" of price competition. He said the primary value to the marketplace would be the integration of services GE could provide, with a single dealer handling all aspects of a distributed processing system. Especially considering the present fragmentation in the market for distributed processing systems, this seems to be a valid claim.

Since the MarkLink system was first advertised on December 12, 1978, the response has been very favorable, according to GE's Simms. As of late January, in addition to the massive account (170 minicomputers and 900 CRTs) with which GE started the MarkLink development project, a chain of hotels has signed on for a national reservations system, a large company has agreed to install an order entry and inventory control system, and two other firms have signed letters of intent to join the MarkLink system.

In some ways, the GE package resembles an offering by ADP Network Services (see box). Both companies have a long history of offering time-sharing services. Both are now offering an on-site distributed processing element to complement the massive central CPU systems built originally for conventional time-sharing.

For major users of commercial time-sharing, especially those with multi-site needs, these two offerings should be on your "must see" list of new data processing products.

### **ADP SAYS ITS "ONSITE" IS STILL A UNIQUE SERVICE**

ADP Network Services, a major competitor of GE in the commercial time-sharing business, was first to offer an integrated system in which customers lease an on-location computer to reduce their monthly processing charges. The ADP OnSite service includes a DEC 2020 computer which accommodates up to 32 users.

ADP emphasizes that with OnSite, all processing is done at the customer location, and all user programs and the data base reside in the local computer. They say that GE's offering doesn't accomplish this, since the MarkLink Terminal is only intended for temporary storage and the limited processing of data on its way to the big CPU complex at a GE processing center.

With ADP, on the other hand, the OnSite computer is said to do all the work, with remote ADP time-sharing computers accessed only rarely in a typical application. ADP says worldwide communications of data are still possible, because each OnSite computer is linked to the ADP time-sharing network. But while the remote user logging on from a foreign city accesses the network communications lines, in the end his data is processed only by the company's OnSite computer, and is not subject to CPU time charges. As each remote user logs on to the ADP network, he specifies a particular OnSite computer he will be working with. A multi-location application can be centered around one or more OnSite computers in this way.

Thus ADP maintains it has a complete in-house time-sharing system. By doing away entirely with the need to access an ADP headquarters CPU (except for data backup or in case of local equipment failure), ADP claims the OnSite system can process for \$20,000 or less a work load that would cost \$35-40,000 on a MarkLink system.



### **Durango's F-85, Smallest of the Small**

*It's only been about a year since Durango was formed, but shipments have already begun on the firm's new F-85 desktop computer. An all-in-one-package system aimed at small business, the F-85 consists of printer, keyboard, CRT display, and mini-diskette drives. Especially since Durango is now talking about adding communications ability to the F-85, which would allow it to be used in a distributed processing environment, we feel the system deserves a closer look at this time.*

The F-85's designers quite correctly call their new product a desktop computer, and it does fit the description. By combining the components inside a single plastic case, Durango has put a considerable amount of computing power—and all the accessories thereto—within arm's reach.

In price, the F-85 comes in at the low end of the business application microcomputer market with a \$13,520 bottom line. Programming is in Basic, with additional software modules available to meet most of the needs a small business would normally have in the way of accounting, payroll, invoicing, and so on.

#### **Hardware Design**

Central to the F-85's design is a dot-matrix impact character printer tucked behind the keyboard. The Durango engineers designed this themselves in order to create the framework around which other components could be fitted. The printer accepts standard computer-width forms, and has a print element that works both left-to-right and right-to-left. With this bidirectional capability it can put out 165 characters a second. The nine-by-nine dot matrix can be squeezed by program control into a tighter pattern yielding 217 characters on a line, enough to place 12 columns of figures on a single sheet.

Just in front of the printer is the keyboard, which includes a standard typewriter set, a 10-key numeric pad, a couple of columns of control keys, and a column of function lights at extreme left on the keyboard.

To the left of the printer sits a display screen angled slightly toward the operator. This 9" CRT displays 24 lines of 80 characters each.



The F-85 comes with two mini-diskette drives, which may be either single- or double-sided. Either way, a high density format is used, providing close to a Megabyte between two single-sided floppies or about 1.9 Megabytes between a pair of dual-sided diskettes. The drives are made for Durango by Micropolis.

Upon seeing the positioning of the printer apparatus and keyboard, one might gain the impression that the printer is to be used simultaneously with the keyboard, typewriter-fashion. But instead, the printer is treated as a program-controlled device, and the screen fulfills the function of showing previous operator actions and prompting further steps.

Durango salesmen in the Bay Area, where the initial marketing thrust is strongest, like to emphasize the system's compactness by carrying the F-85 to the customer's office for an on-the-spot demonstration.

#### **Software Features**

The F-85 can be user-programmed in Basic, or can be operated with Durango-supplied small business



applications software. The applications software is available at extra cost, and is said to be provided with instructional materials, training, and assistance in converting from previous procedures to the system.

The Basic compiler supplied as standard equipment includes 14-digit floating point arithmetic (for precise scientific or statistical calculations) and a number of other features, among them string and array processing. An interactive editor is also provided.

The applications software packages available at this time include five different aspects of small business accounting. The central package is the general ledger software. This may be linked with accounts payable, accounts receivable, sales order processing, and payroll packages so that each element in the software system reports as needed to the general ledger, keeping the accounting system integrated.

The system may be implemented either fully or in any combination of the packages. Durango expects many first-time computer customers to begin with accounts receivable and invoicing functions, and later follow up by gradually converting payroll, accounts payable, and general ledger to the computer system as it becomes a part of the business's overall accounting system. Durango maintains that the system can be installed and integrated smoothly into a business acquiring computerization for the first time.

### **The Durango Background**

For such a new computer company, Durango offers some impressive credentials. Its president, George Comstock, and two other executives came over from Diablo Systems, the now-Xerox subsidiary that Comstock started in the sixties. Diablo, of course, is a leading producer of daisy-wheel character printers, and the individual records of Comstock, Waggoner, and John Scandalios, Durango's marketing vice-president, in the Diablo success story do lend credibility to their quest for a position in the desktop computer field.

Durango was formed about a year ago when Comstock apparently became stifled in the Xerox bureaucracy and distressed at the setback in his own fortunes that resulted from the fall of Xerox stock in price from \$170 a share when Diablo was merged into it to \$40 a share. The starting three captured \$1.5 million in front money from two venture capital groups and began work on the system design, later snaring an addition \$2.5 million backing in the first year.

Some sixty employees now work for them. Despite the fact that few systems have been installed yet (most of them in the Bay Area where Durango maintains a direct sales force), Comstock is predicting that 1000 units will go out the door in 1979.

### **Looking Ahead**

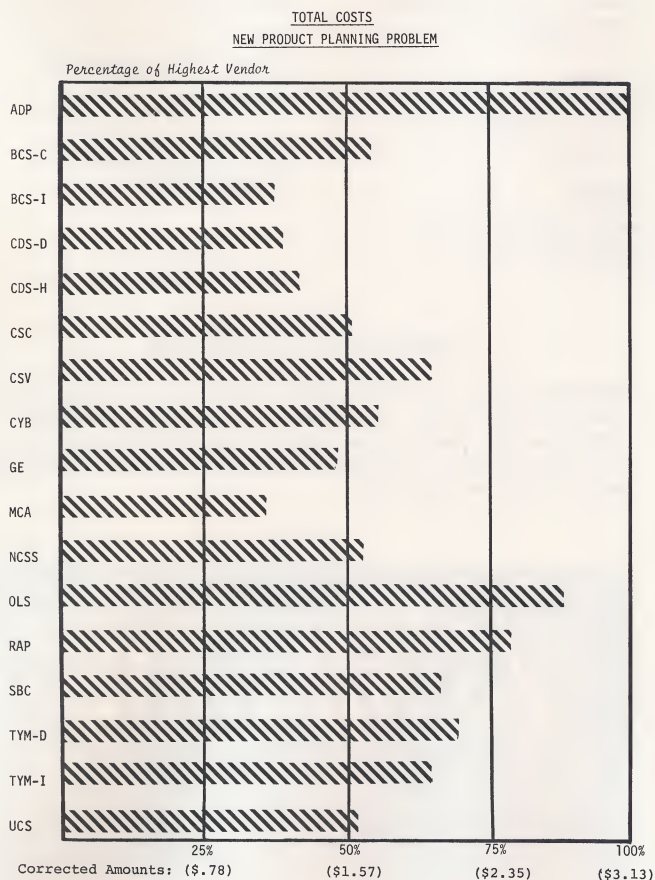
Since the firm is so young and the product, at this point, so untried, evaluation of the system's operation cannot really be made at this point. The design approach seems sound, and the firm's engineering department talks about adding communications capabilities (including RS-232 and IBM 2780/3780 simulation) that will make it applicable to big business as well as small. Those enhancements are scheduled for this spring. Beyond that, the company is considering a built-in modem for the machine, the possibility of controlling additional display screens from the basic unit (minicomputer fashion) and even adding a hard disk capability. These last three seem at least six months or more away, and though touted in company literature as if here today, are still, as Waggoner put it, "under evaluation."

Like many other small computer companies, Durango isn't afraid to claim tomorrow as already its own, advertising features that are not yet implemented. This practice is so widespread, however, that one can hardly single out one firm for joining in. It could be they'll succeed in stuffing all that technology in there. If they do, the F-85, driving a hard disk and four CRTs and communicating by modem, will be as saucy a competitor as any desktop computer system the industry is likely to come up with. At least until next year.



## CORRECTION

In our last issue, the chart on page 9 in the article by RDC contained several errors. First of all, the scale at the bottom was shown incorrectly; and secondly, the bar for UCS should have indicated 52%. Below is the entire chart the way it should have appeared, and we apologize for any confusion the errors might have caused. HS



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